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Opinions

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By John Lynn

Can Methanol Really Make a Dent in US Oil Demand?

Ed note: A few days ago, we ran a piece by Geoffrey Styles which was extremely skeptical about the ability of methanol to displace traditional motor fuels. We were contacted by the methanol industry which, understandably, wants to give their side of the story. To be clear, we at Energy Tribune remain skeptical about methanol. But in the interest of equal time, we agreed to publish this piece by John Lynn of the Methanol Institute.

For an alternative transportation fuel system to succeed, you need to have several ingredients. Since the world's fleet of cars, trucks and buses require a lot of fuel, you need a large feedstock resource base for the alternative fuel to make any kind of a meaningful dent in oil consumption. The extraction, refining and distribution of gasoline and diesel fuel is highly efficient and cost-effective, so for alternative fuels to compete at the pump you have to find a way to do so economically (preferably without the need for expensive and long-term government incentives). Alternative fuels will also have to do better than the petroleum-based products on the "well-to-wheel" analysis, showing significant reductions of greenhouse gas and criteria pollutant emissions. Finally, you can't forget the consumer. The transition to any alternative fuel has to be smooth and simple for the customer at the pump (or plug). It has been more than a decade since a US automaker sold a methanol flexible fuel vehicle, but no other alternative fuel has really taken off in the intervening years. Methanol is now re-emerging as the clear alternative transportation fuel precisely because it has all the necessary ingredients for success.

Methanol can be produced from a wide variety of feedstocks, including natural gas, coal, biomass, and even atmospheric carbon dioxide. On a global basis, methanol consumption in 2008 was approximately 45 million metric tons or nearly 15 billion gallons. This is roughly equivalent to global fuel ethanol demand. There is significant potential to produce vast quantities of methanol in the United States and other parts of the globe from a wide variety of feedstocks. According to the Energy Information Administration, 19.28 Trillion cubic feet (Tcf) of dry natural gas was produced in the United States in 2007. Since it takes about 100 cubic feet of natural gas to produce one gallon of methanol, the production of 10 billion gallons

of methanol would require 1,000 Bcf of natural gas, or just 5% of current US natural gas production. According to the EIA, the US produced 1,146 million short tons of coal in 2007. With about 5,000 short tons of coal needed to produce one million gallons of methanol using proven gasification technology, production of 10 billion gallons of methanol would require 50 million short tons of coal, or just 4% of current coal production. Finally, according to a joint report by the Departments of Energy and Agriculture, US forestland and agricultural land, the two largest potential biomass sources, represent over 1.3 billion dry tons per year of biomass potential. Using mature gasification technology, one ton of biomass can be used to produce 165 gallons of methanol. The production of 10 billion gallons of methanol would require, 60 million tons of biomass, or less than 5% of the biomass production potential.

The technology to capture carbon dioxide emissions from chemical and power plants – and even the atmosphere – for methanol production is now moving from the lab to the pilot plant scale, and is expected to reach commercial market introduction quickly. In a carbon constrained world economy, methanol could be the solution. Not only can methanol be used directly as a vehicle fuel, it also can be used to produce gasoline (through processes developed by Exxon Mobil and others), as well as in the manufacture of important gasoline components such as olefins.

Producing methanol from natural gas for use as a transportation fuel (and, yes, engines optimized to burn methanol can be much more efficient than their gasoline counterparts) generates about as much carbon dioxide as using refined gasoline in an internal combustion engine. And while producing methanol from coal roughly doubles greenhouse gas emissions, because the process uses gasification technology, the carbon dioxide is separated out before combustion, so the race for carbon capture, sequestration and use could be won by coal-based methanol. Of course, producing methanol from biomass will help significantly reduce greenhouse gas emissions (Volvo and others have found biomethanol to be one of the most GGE frugal fuels), and making methanol from power plant flue gas CO2 or even atmospheric CO2 is a total game-changer.

On the economic front, methanol is a real winner too. Current spot market prices for methanol on the Gulf Coast are about 65 cents per gallon. Methanol does have a lower energy content than gasoline, so we use a conservative multiplier of 1.65, that is, it takes 1.65 gallons of M-85 (a blend of 85% methanol and 15% gasoline) to provide the same energy content or vehicle range as a gallon of gasoline. When you add the cost of the methanol, the 15% gasoline, taxes, distribution and retailer mark-up, plus account for the lower energy content, the gasoline-equivalent pump price for methanol would be $1.98 today. That’s considerably less than the current nationwide average of $2.46 for regular gasoline. On the fueling infrastructure side, it costs about $60,000 to put in an underground storage tank and a methanol pump, considerably less than the $2 million it takes to add a hydrogen pump to the corner service station.

So now let's turn to what is happening today with methanol fuels.

In 2007, China firmly established itself as the driver of the global methanol industry, becoming the world's largest methanol producer and consumer. China also leads the world in the use of methanol as an alternative transportation fuel, blending over one billion gallons of methanol in gasoline last year. Taxi and bus fleets are running on high methanol blends (M-85 to M-100), and retail pumps sell low level blends (M-15 or less) in many parts of the country. At the same time, China is developing production capacity for dimethyl ether (DME) – using coal-based methanol as a feedstock – for markets as a blendstock with liquid petroleum gas (LPG) used for home heating and cooking and as a diesel substitute for buses.

For more than a decade, provincial leaders in coal-producing provinces (Xinjian, Shanxi, Shaanxi, Henan, Inner Mongolia, Beijing Shi, Hebei, Anhui, Guangdong and Sichuan) have been developing methanol fuel demonstration programs. These efforts have involved methanol producers, automakers, and academic institutions. In September 2006, eight leaders provided a report to then-Chinese President Hu Jintao titled "Suggestion on Promoting Methanol Fuels to Replace Gasoline and Diesel Fuel." President Hu approved this "Suggestion" and directed the powerful National Development and Reform Commission (NDRC) to explore the use of methanol fuels. The NDRC now considers coal-based methanol to be a strategic transportation fuel, and directed the development of national methanol fuel blending standards.

In recent weeks, China adopted national standards for neat methanol (M-100) to be used for fuel blending and standards for M-85 used in flexible-fuel vehicles and dedicated methanol-fueled cars, trucks and buses. The M-85 standard becomes effective across China on December 1, 2009. A separate standard for M-15 is now being completed, following an 80,000 kilometer road-testing program. Adoption of these national standards is a critical step towards China's use of methanol fuels. If just 5% of China's cars used M-85 or M-100 fuel and another 15% use M-15, China would displace 14 million tons of gasoline (5 billion gallons) and significantly reduce its dependence on imported oil.

China's automotive industry is already stepping up to meet this challenge. The country's fastest growing independent automaker, Chery Automobile, has competed demonstration work on 20 methanol flexible-fuel vehicles now ready for full-scale production. Shanghai Maple Automobile has announced plans to build 2,000 methanol cars. Chang'an has introduced the methanol-fueled BenBen car. Greely Automotive has put its Haifeng methanol car into production. Shanghai-based Huapa Automotive has built a number of methanol fueled cars. Shanghai Automotive Industry Corporation, one of the big 3 automakers in China, is developing a number of methanol-fueled cars. With the introduction of national methanol fuel standards, the large international automakers – GM, Ford, Toyota, Audi, BMW – selling cars in the fast-growing Chinese market are also expected to follow suit.

Unfortunately, the automotive industry in the United States is opposing legislation that would spur the introduction of methanol-fueled cars. The Open Fuel Standard Act (OFS) would require that starting in 2012, 50% of new automobiles, and

starting in 2015, 80% of new automobiles, be flexible fuel vehicles or "FFVs," warranted to operate on gasoline, ethanol, and methanol. By establishing this requirement, Congress can break the "chicken versus the egg" syndrome that has stymied alternative fuel vehicle market introduction. With transformation of the US car fleet to FFVs, the OFS will open new markets for methanol and ethanol fuels.

The House-passed American Clean Energy Security Act included drastically watered down provisions of the OFS by permitting but not mandating that the Department of Transportation require that an unspecified minimum of new cars be fuel choice enabled in an unspecified timeframe. In the late 1980s, legislation was adopted in California to require fuel retailers to add methanol pumps if methanol FFV sales in the state reached 20,000 vehicles. This was a well-meaning attempt to encourage the parallel growth of methanol fueling infrastructure and FFV vehicles, but in reality it led the fuel retailers to encourage automakers to ensure that the fleet of methanol FFVs never reached the 20,000 vehicle "trigger." Unfortunately, the House version of the energy bill may encourage a similar situation, in this case with the automakers encouraging the fuel retailers to slow the growth of alcohol fuel pumps.

Energy Secretary Steven Chu recently stated that the cost of upgrading these cars is "about $100 in gaskets and fuel lines," which we believe to be still higher than the actual cost. A review of replacement part costs for FFVs and conventional vehicles shows virtually the same parts for each model, with close to zero incremental cost. The automakers have complained that passage of the OFS would "divert important limited resources away from the development of other advanced vehicle technologies," a tired argument used in promoting decades-away hydrogen fuel cell vehicles over near-term improvements in fuel economy improvements for today's cars. Only a few months ago, the CEOs of General Motors, Chrysler, and Ford appeared before Congress and each committed that they would make 50% of their cars FFVs by 2012. Now they want to renege on this commitment to alternative fuels. As New York Congressman Eliot Engel states, "It is a simple and inexpensive modification that should be standards in cars, like seatbelts or airbags."

To recap: we know methanol fuel is cheaper than gasoline, and can be cleaner, too. We also know that the cost to add methanol fueling capability to a new car is inexpensive, as are the methanol fueling pumps. Further, we know -- contrary to what some purport -- that methanol is a safe and effective transportation fuel. California successfully ran 15,000 methanol FFVs, logging millions of miles, finding no technical barriers to the use of methanol in cars. Methanol is toxic, but so is gasoline, so lets agree not to drink our fuel. Californians did not report a single case of methanol poisoning from their pumps or cars. Methanol is harder to ignite than gasoline and burns with just one-eight the heat, so we can save thousands of lives each year by switching from gasoline to methanol.

Turning back to Washington, the OFS is all about choice. By ensuring that new cars can run on gasoline, ethanol and methanol fuels, the consumer can decide which fuel to pump. For fuel providers, the OFS opens new opportunities to produce clean transportation fuels from natural gas, coal and renewable biomass feedstocks. The

US may do well to follow the Chinese example and embrace methanol as a strategic transportation fuel: it is the clear alternative.

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